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Project for a Europe-Africa fixed link through the Strait of Gibraltar

Note by the Secretary-General

1. The Secretary-General has the honour to transmit to the Economic and Social Council the report prepared in accordance with Council resolution 2009/11 of 28 June 2009 by the Executive Secretaries of the Economic Commission for Europe and the Economic Commission for Africa on the activities carried out within the framework of the project for a Europe-Africa fixed link through the Strait of Gibraltar.

2. The Council has been interested in this project since 1982, following the decision taken by the Governments of Morocco and Spain within the framework of a bilateral agreement on cooperation adopted on 24 October 1980 for the joint study of the feasibility of the project. Since that time, the Council has regularly requested the two regional commissions to follow the development of the project studies and keep it informed in that regard.

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Project for a Europe-Africa fixed link through the Strait of Gibraltar: report on activities carried out during the period 2009-2011 and programme proposed for the period 2011-2013

Summary

The present report, prepared jointly by the Economic Commission for Europe and the Economic Commission for Africa pursuant to Economic and Social Council resolution 2009/11 of 28 June 2009, summarizes the work done under the authority of the Spanish-Moroccan Joint Committee by the two engineering firms, Sociedad de Estudios para la Comunicación Fija a través del Estrecho de Gibraltar (SECEGSA) and Société Nationale d'Etudes du Détroit de Gibraltar (SNED), in connection with the fixed-link project.

The period 2006-2011 was devoted to updating the project's feasibility phase and undertaking an overall evaluation. It consisted of:

- Updating the tunnel studies on the basis of site data gathered during the previous phase and establishing the environmental impact of the project.
- Revising tunnel traffic estimates and analysing the economic and financial situation of the project in the light of updated traffic data and construction costs; establishing socio-economic impact on the States of the region and determining related regulatory, legal and support measures connected with construction and operation.
- Presentation of the project to the Euro-Mediterranean Transport Forum meeting held in Brussels on 30 May 2007. The Forum included it among its priority projects for the region.
- Presentation of the project to the European Commissioner for Transport by the Ministers of Transport of Morocco and Spain, in order to seek European Union financial and political support for the link and for southward rail extensions, at a dedicated meeting held in Luxembourg on 8 June 2007.
- Preparation of a multipoint, comprehensive, evaluation report by specialist consultancy firms.

The 2011-2013 phase will focus on the preliminary project study and therefore on a wider programme of research and complementary studies needed to identify and analyse in greater depth an option with a reasonable probability of technical feasibility and respecting the time frame set out. This analysis should result in the best possible construction plan and the establishment of a list of actions intended to reduce uncertainties and consolidate costs for the duration of the project, thus providing a solid basis for decision-making.

I. Introduction

1. In its resolution 2009/11 of 28 June 2009, the Economic and Social Council requested the Executive Secretaries of the Economic Commission for Africa and the Economic Commission for Europe to continue to actively take part in the follow-up to the project for a Europe-Africa fixed link through the Strait of Gibraltar and to report to the Council at its substantive session of 2011 on the progress made on the project studies.

2. The purpose of the present report, prepared jointly by the two regional commissions on the basis of information obtained from the two companies in charge of carrying out the project studies, is to respond to the provisions of the resolution referred to above. The report includes, first of all, a summary of activities[1] undertaken from 2006 to 2011, with a focus on the outcome of the overall evaluation and, secondly, a summary description of the principal activities to be undertaken between 2011 and 2013 to advance the project.

3. It will be recalled that the studies for this project are taking place within the framework of the bilateral agreements signed by the Governments of Morocco and Spain, respectively, on 24 October 1980 and 27 September 1989, whereby the two parties agreed to study jointly the feasibility of the project for a fixed link through the Strait of Gibraltar on the basis of an equal sharing of costs, under the authority of a permanent intergovernmental Joint Committee, with the help of two State engineering companies, namely the Sociedad de Estudios para la Comunicación Fija a través del Estrecho de Gibraltar (SECEGSA), whose head office is in Madrid, and the Société Nationale d'Etudes du Détroit de Gibraltar (SNED), whose head office is in Rabat.

4. After several stages beginning in 1980, the study process has been focused, since 1996, on the basic option comprising a rail tunnel driven beneath the sill of the strait, comprising two unidirectional rail tubes connected to a central service and safety gallery. The functional design, which is similar to that of the Channel Tunnel, allows for the interconnection of the two countries' railway networks and, in addition, the crossing of road vehicles on shuttle trains running between two terminal stations, one in Spain and the other in Morocco. Typical lengths for the structure in its current form would be 42 kilometres between terminals, 37.7 kilometres of which would be tunnel, including 27.7 kilometres of undersea tunnel. This basic option, identified in 1996, has been revised in the light of newly acquired geological and geotechnical data and evaluated within the framework of an overall evaluation of the project, which could give rise to changes in the longitudinal profile and functional design.

5. Owing to technical and economic considerations and subject to the results of the studies on the development of relevant aspects of the basic option, the construction process envisaged includes the excavation of a 17-kilometre undersea exploratory gallery from the Moroccan side. This is needed to establish the exact nature of the geology in the area, determine the best construction method and refine the cost and timeline forecasts for tunnel construction. The boring will require detailed preliminary pilot project studies based on new geotechnical data that will need to be collected.

[1] Technical and socio-economic activities were summarized in the note presented at the substantive session of 2009 (E/2009/63).

6. At the current stage of exploration, the uncertainties both about the geometrics of the palaeochannels and the geomechanical properties of their formation are too significant for such a major project. Additional research will be needed to help to resolve these uncertainties and orient the technical and economic feasibility assessment towards the most likely scenario before beginning any excavation of an exploratory gallery. Considering the size, importance and exceptional nature of the project, a more extensive programme of additional exploration and studies is needed. It should be remembered that similar projects routinely require geological and geotechnical exploration representing 4-5 per cent of construction costs, while the equivalent figure for this project is only about 0.3 per cent.

II. Activities carried out during the period 2006-2011

7. The studies and exploration conducted have examined:

(a) The physical environment, through updating of geological maps of the north and south shores, follow-up of the experimental work at Malabata (Morocco) and Tarifa (Spain), additional geotechnical tests on the breccia and measurement of sea currents in the Strait;

(b) The engineering aspect, through updating of the preliminary pilot project for the basic option and the environmental impact study;

(c) The socio-economic environment, through the traffic-forecasting model, the economic and financial evaluation and the regional effects study;

(i) The establishment of a documentary database;

(ii) The overall evaluation of the project.

A. Results of the overall evaluation

8. The overall evaluation study, launched in 2009, aimed to assess the available studies and research and to propose future action to advance and manage the project. It was carried out by an independent consortium consisting of eminent Danish, French and Swiss consultancy firms with proven expertise in the construction and operation of projects similar to the Strait of Gibraltar link.

9. The objective of the overall evaluation was to draw up an end-of-stage report, based on the evaluation of the project as a whole and of its feasibility, providing an in-depth analysis of its technical characteristics, the phases of its implementation, elements of socio-economic and environmental evaluation and the costs and time frames for its construction. It consisted of:

(a) Assessment of the research undertaken, the available geological and geotechnical data and the technical studies, with a particular emphasis on in-depth analysis of the technical and environmental characteristics and the components of the project in order to highlight strengths, weaknesses, uncertainties and risks;

(b) Evaluation of the technical and environmental studies to establish the construction-related risks of the project (particularly in connection with the exploration tunnel), using state-of-the-art technology, supplies and equipment, and methods of dealing with problematic terrain;

(c) The economic and financial evaluation covering economic efficiency, growth in intercontinental transport, distribution of the benefits among the countries involved and financial prospects that make the project more attractive to the private sector;

(d) A large-scale sensitivity analysis of the various scenarios that might be considered, comprising physical and technical aspects, demand for transport, and financing, and linked to the technical and financial risk analysis;

(e) A benchmarking analysis with the Channel Tunnel and the Seikan Tunnel for the various aspects of the evaluation.

Principal results

1. Geostrategic aspects

10. The evaluating consultant confirms that the project will affect an extensive intercontinental area of Europe and Africa beyond the immediate area of the facilities as a result of growth in trade in goods and services and increased international mobility. It will serve as a strategic hub in a process of regional economic integration that will ultimately contribute to sustainable development, peace and stability in the region.

11. Given this unique characteristic of the project, its strategic geographical position, the size of the investment and the complexity of implementation, the evaluator believes that much more is at stake than merely a cross-border transport construction project traversing a strait and that the project's full implications can be grasped only in the light of its geostrategic context.

12. In terms of impact at the transcontinental level and for the Mediterranean region, the project will provide a strong, continuous and permanent link between transport systems. The position of the fixed link at the gateway to the Mediterranean, and the presence of two large international ports, Tanger-Med in the south and Algeciras in the north, will make it an intercontinental hub. It will increase development potential by becoming a world-class logistical platform through its integration into the trans-European and North African transport networks and their extensions into neighbouring regions and countries.

13. This outlook is in line with the main objectives of Euro-Mediterranean transport policy under various cooperation programmes, including the Regional Transport Action Plan for the period 2007-2013 approved in Brussels in May 2007 by the Euro-Mediterranean Transport Forum and the programme of the Union for the Mediterranean, which emphasize the importance of transport development in the region.

14. In this transcontinental context, the project is part of the overall transport development strategy for the western Mediterranean adopted through the Euro-Mediterranean bodies' work in the region. Those efforts have been spurred on by strong political will and close international relations among the transnational stakeholders.

15. In terms of impact on neighbours Morocco and Spain, the fixed link is beneficial to those countries' plans for developing the high-speed rail and highway transport networks currently under construction. Linking these networks together

would enable them to diversify the choice of services available, ensure continuity of service even in extreme weather and shorten the crossing time to the length of an inter-city trip. It could lead to the emergence of significant demand for transport that is difficult to gauge at this point.

16. In terms of local impact, the project is part of a much broader regional development framework involving the ports in particular. The ports of Tanger-Med and Algeciras are currently undergoing expansion and adding capacity, seeking a strategic position in the international transport network. The project will add value to and complement these port facilities and could become a real spur to local development.

17. The project may well help the Moroccan economy to flourish by giving a new impetus to development measures that will have a positive impact on growth. Spain could also benefit from the development opportunities offered by the project if strategic accompanying measures are put in place.

18. In conclusion, the project's geostrategic component and the development potential of mass transport networks using long-distance railway links weigh heavily in favour of its implementation and of the involvement of the international community, particularly in its financing, reflecting its wide-ranging implications and impact.

2. Involvement of institutional actors

19. Economic and Social Council decisions and resolutions have already led to the involvement of institutional actors in the development of the project. This initiative should be pursued and, at a relatively early stage before the specific features of the project are defined, should be extended to all potential partners that might become involved in the project itself or in a related aspect.

20. The process of consultation and of involving international actors in decision-making should be paralleled by a process of involving those actors in sponsoring the project, especially in financial terms. The project's major geostrategic implications fully justify such an approach, with partners' right to a voice in directing the project being naturally coupled with a duty to provide it with support.

21. The European Union, which has been discussing the project, will be one of the leading partners, if only because North Africans living abroad, who make up a large percentage of the facility's potential users, are European Union taxpayers, and the bulk of goods travelling through the tunnel would come from Europe. For that reason, the complexity of the project and its economic and financial impacts transcend the bilateral framework of the two instigating countries.

3. Technical aspects

22. The undersea drilling campaigns already completed benefited from several innovations that led to improved survey results for each campaign and the development of expertise that can be put to use in the future. The last drilling survey (2005) reached significant drilling depths of around 325 metres below the sea bed in a body of water 275 metres deep. The drilling campaigns (1997, 1999 and 2005) revealed a sand lens at a depth of 100 metres and two troughs filled with breccia in the middle of the strait at a depth of over 600 metres below sea level, making it necessary to tunnel through the breccia.

23. The available information about the geological conditions and geomechanical properties show that drilling through the centre of the Strait (the two palaeochannels) could be extremely difficult. The time and money needed for the excavation work could jeopardize the economic feasibility of the project.

24. Despite the extensive work done, the project's technical feasibility remains a major question and cannot be fully confirmed at present. At the current stage of exploration, the uncertainties as to the geometrics of the troughs and the geomechanical properties of their geological formations are too significant for such a major project. It is therefore impossible at present to make a determination as to the feasibility of the project.

25. Additional research will be needed to help to resolve these uncertainties and orient the technical and economic feasibility assessment towards the most likely scenario before beginning any excavation of an exploratory gallery. Considering the size, importance and exceptional nature of the project, a more extensive programme of additional exploration and studies is needed. Similar projects routinely require geological and geotechnical exploration representing up to 4 or 5 per cent of construction costs, while the equivalent figure for this project is only about 0.3 per cent.

26. The current project (dual-tube with or without a service/safety tunnel) is seeking to reduce investment costs through implementation in two phases, an operating system designed to handle gradients of 30 per cent over 17 kilometres, dead-end terminals, rolling stock requiring a rapid pace, use of open railway equipment and a secure stopping area. It also provides for the prior excavation of an exploratory gallery which would be converted into a smoke extraction gallery during actual implementation of the project. Its construction should be conceived as part of the survey and exploration process intended to confirm or deny the technical feasibility of the project.

27. The environmental impact study for the project was carried out in accordance with generally accepted regulations (on terminals, ramps, roads, railways and other access and power infrastructure). The study lists the sources of impact and identifies and assesses the environmental effects of the pre-construction phase (in particular wastewater treatment and transport and unloading of aggregates for concrete and of excavated material) and the construction and operation phases (in particular the impact of the ramps on any groundwater, tunnel ventilation and air venting, drainage of the terminals and venting of hot air from a tunnel cooling system). In areas where the project outline is sufficiently detailed, there is in-depth analysis of the related aspect.

28. The ultimate goal is to identify and analyse in greater depth an option with a reasonable probability of technical feasibility and respecting the time frame set out. This analysis should result in the best possible construction plan and the establishment of a list of actions intended to reduce uncertainties and consolidate costs for the duration of the project, thus providing a solid basis for decision-making.

4. Socio-economic aspects

29. The socio-economic studies are the result of thorough analysis conducted using high-quality tools. The size and quality of the databases on traffic,

demographics and economics that were analysed by the consultant, whether compiled by companies or derived from official sources, should be underscored. In particular, the volume of data and the periods covered are extensive. The methodology sought to take advantage of the fact that studies began in 1982, making it possible to draw up a chronology spanning more than 20 years.

30. The project is more than just a technical feat or infrastructure linking two continents; it is also a service offered to a large, transnational body of users. An exact definition of the transport offering is thus essential, because in the eyes of potential users, the project and the service offered are one and the same.

31. The analysis of mega-projects carried out in the regional effects study provides illuminating examples of the benefits of projects of this size and the institutional entities that have participated in sponsoring such projects internationally. The necessary accompanying measures will rely on a variety of participants, ranging from municipalities (to create designated development areas such as those in Calais (France) and the new Ørestad district in Copenhagen), to the European Commission, to map out Euroregions in the areas surrounding the cross-border facilities. Other stakeholders such as port authorities may be involved, as was the case, for example, in the merger of the ports of Malmö and Copenhagen.

32. The purpose is to determine, using various scenarios, the parameters (in terms of technical design, phasing, performance, mode of operation and costs) of an attractive service that will enable the project to play its role as a "strong link" between Europe and Africa and to capture the potential traffic shown in the traffic forecasting studies.

B. Proposed future action

33. The upcoming stage of the programme will give global visibility to the project development management and provide decision makers with a more accurate idea of the construction costs and timelines for the components of the facility. This will require the investment of greater sums for both exploration and studies, the purpose of which is to provide a level of understanding and findings that will allow decisions to be taken on future stages. This strategy will help decision makers progressively reach a conclusion as to the feasibility of the project. It comprises the following:

1. Additional exploration

34. The next undersea drilling campaign consists of performing an optimal number of deep drilling surveys in the central area of the sill of the strait using drilling techniques already tested in the Strait of Gibraltar and improved and developed to meet not only geological goals — particularly to determine the exact boundaries of the breccia — but also and more importantly, geotechnical goals.

2. Resumption of technical studies

35. The purpose of resuming the technical studies is to review the technical options for the project through more in-depth and objective analysis of the technical scenarios that might be considered and the geotechnical and baseline construction scenarios for tunnelling the exploratory gallery, which will entail a substantial

investment. This will provide tools that will improve the chances of successful construction in terms of what might be envisaged based on available data.

3. Operation and capacity study

36. The purpose is to determine, using various scenarios, the conditions (in terms of technical design, phasing, performance, mode of operation and costs) of an attractive service that would enable the project to play its role as a "strong link" between Europe and Africa and to capture the potential traffic shown in the traffic forecasting studies.

4. Definition of service offered

37. The project is more than just a technical feat or infrastructure linking two continents; it is also a service offered to users. An exact definition of the transport offering is thus essential, because in the eyes of potential users, the project and the service offered are one and the same. The definition of the service offered is closely linked to the operating and capacity study mentioned above.

5. Safety studies

38. The safety studies conducted to date have been based on agreed assumptions for the phased commissioning of the project, justified existence of a secure stopping area, and presence of a smoke-extraction gallery used in the construction phase as an exploratory gallery. These safety studies were to consider the possibility of incorporating several secure stopping areas and longitudinal ventilation without a smoke-extraction gallery, and to be enhanced by considering, among other things, factors pertaining to the optimal operation of the structure.

6. Risk analysis

39. Risk analysis must be considered as a decision-support tool within the wider project management framework. As overall risk is the sum total of individual risks or types of risk, aspects of the project that could create or reveal significant risks need to be analysed carefully.

7. Greenhouse gas inventory

40. Given the current mood of the international community and demands in the area of environmental protection, an inventory of greenhouse gases should be taken by estimating emissions generated by implementation of the project (including work and operation) and emissions avoided with the switch from road to rail transport. The objective is to identify and quantify, using available data, emissions generated directly by or attributable to the project at its different stages, in order to establish a carbon footprint.

8. Baseline socio-economic scenario and definition of variants

41. As the project has a major impact on the macroeconomic and demographic situations of the adjoining regions, the socio-economic scenarios should be established by area, according to the divisions set out in the traffic-forecasting model. The final reference scenarios chosen will be developed from forward-looking and logistical studies based on different variants of the reference scenario, by measuring the direct, indirect and incidental impacts of the project on economies.

9. New simulations with the traffic-forecasting model

42. New traffic simulations will be performed based on the aforementioned socio-economic scenarios and an improved method of calculating traffic generated, using the existing traffic-forecasting model.

10. New socio-economic evaluation

43. The new analysis is made possible by a more thorough evaluation of the status of the project through the recommended studies, including the operation study (operation diagram, impact on operation of Spanish and Moroccan high-speed rail lines, rolling stock needed, and operation of trains to estimate the rolling stock and its capacity).

11. Resumption of financial evaluation

44. While the financial simulations model (projected financial statements: balance sheet, statement of earnings and cash flow) used is well structured and acceptable, the results presented cannot be considered conclusive, given the approximations contained in the assumptions and data of the model. A new analysis should therefore be conducted based on consistent assumptions, taking into consideration the new components of the cost of the structure, with the knowledge that long construction timelines cause legal and institutional difficulties that require unique — and even original and still-unpredictable — financial arrangements, and that multiple-option financial models will have to be developed for these financial arrangements.

12. Legal and financial arrangements

45. The financial analysis should include an evaluation of several alternative legal and financial arrangements and not only that of a concession. Several alternative institutional and financial scenarios are possible, all covering risk-sharing between the public and the private sectors.

13. Legal and institutional study

46. The creation of new infrastructure will require the coordinated effort of many authorities at the international level through agreements between the two instigating countries, at the national level within the countries involved, and at the regional and local levels. An institutional study will be needed to determine the measures to be considered in order to set up and manage the legal and financial arrangements outlined in the financial study.

14. Accompanying measures

47. Accompanying measures are vital to the success of the project and, because they will determine its economic stability, they may even determine whether or not it is implemented. Studies of mega-projects have demonstrated that accompanying measures can determine the ability or inability of any project to spur economic and social development in adjoining regions.

C. Additional study and exploration programme

48. To satisfy these demands, the actions listed below have been undertaken.

49. The forty-second meeting of the Joint Committee held in Tangier, Morocco on 29 October 2009 adopted the overall evaluation report, which includes an additional study and exploration programme covering the period 2010-2013.

50. This programme, approved by the co-chairs of the Joint Committee by exchange of letters, is built around 30 activities relating to the physical environment, engineering and the socio-economic and institutional aspects as well as their overall evaluation. It will cost an estimated 21.7 million euros (not included in the companies' operating budgets) and shared equally between the Spanish and the Moroccan companies.

51. The ultimate goal of the programme is to identify and analyse in greater depth an option with a reasonable probability of technical feasibility and respecting the time frame set out. This analysis should result in the best possible construction plan and the establishment of a list of actions intended to reduce uncertainties and consolidate costs for the duration of the project, thus providing a solid basis for decision-making.

52. The objectives of the programme with regard to the physical environment are as follows, in order:

(a) To help improve the geotechnical characterization of the breccias by conducting a deep-sea offshore drilling campaign using in situ geotechnical tests, should they prove feasible, and laboratory tests for samples that will be carefully collected, preserved and stored under good conditions;

(b) To determine the extent of the troughs along the tunnel route; and

(c) To verify that there are no sand lenses along the tunnel route, at least in the areas drilled.

53. The objective of the engineering and environmental activities is to revise the preliminary pilot project for the tunnel option, in order to:

(a) Consolidate the technical feasibility of the structure in the light of geotechnical data generated from the under-sea drilling campaign;

(b) Review the criteria for the design of the tunnel to make it more attractive and competitive vis-à-vis other modes of transport;

(c) Conduct an environmental assessment, identifying sources of impact of the different phases of the project and preventive, compensatory and mitigation measures, in accordance with international environmental protection standards.

54. The objectives of the socio-economic activities are to:

(a) Highlight the role of the project as an ideal logistical platform for trade development in the region;

(b) Determine an attractive service in terms of technical design, phasing, performance, mode of operation and costs;

(c) Conduct an economic and financial evaluation by estimating the traffic generated, establishing appropriate financial scenarios and analysing the overall risk of the project.

55. The overall summary report which will conclude the programme will be drawn up in accordance with the elements mentioned above, in order to highlight the

results of the technical feasibility study and the financial, economic and environmental evaluation, to make it easier for the Joint Committee to reach a decision on the prospects for developing the project.

III. Conclusions

56. The results of the last offshore drilling campaign removed some geological uncertainties regarding the central portion of the undersea alignment of the project. The engineering studies served to define the geometric and functional characteristics of the exploratory gallery called for by the basic option adopted for the project and, subsequently, those of the rail tunnel. The environmental study evaluated the impacts of the project in that area and the measures needed to counter them. The socio-economic and traffic-forecasting studies helped to define the remaining variables needed to evaluate the project.

57. The technical, environmental, socio-economic and legal parts of the overall evaluation stressed the questions to be answered in the study of the geotechnical characteristics of undersea geological formations (breccias) and shortcomings in the development of certain technical and security aspects of the basic option.

58. The workplan will open the way to a new phase in which even more critical new tasks will have to be undertaken to work out the solutions for a project of such magnitude.